

REMARKS

Claims 7, 9, 11 and 13 are pending in this application. By this Amendment, claims 11 and 13 are amended. Claim 13 is amended for clarity. Support for the amendments to the claims may be found, for example, in the original claims and in the specification at page 8, line 12 to page 9, line 1. No new matter is added.

In view of the foregoing amendments and following remarks, reconsideration and allowance are respectfully requested.

I. Interview

The courtesies extended to Applicants' representative by Examiner Gugliotta and Supervisor Sample at the interview held February 5, 2009, are appreciated. The reasons presented at the interview as warranting favorable action are incorporated into the remarks below and constitute Applicants' record of the interview.

II. Claim Rejections Under 35 U.S.C. §103(a)

A. Tomita and Stobbe

The Office Action rejects claims 7, 9, 11 and 13 under 35 U.S.C. §103(a) over WO 02/081406 A1 (the Examiner uses U.S. Patent Application Publication 2004/0033893 to Tomita et al. as an English language equivalent for the purposes of examination) ("hereinafter" Tomita) in view of U.S. Patent No. 7,179,430 to Stobbe et al. (hereinafter "Stobbe"). Applicants respectfully traverse the rejection.

Independent claims 7 recites in-part (emphasis added):

Claim 7:

adding and kneading at least an aggregate raw material, water, an organic binder, a pore-forming agent, and an alkali metal source to obtain clay, the aggregate raw material comprising metal silicon and/or a non-oxide ceramic containing silicon;

forming the clay into a honeycomb formed body having a plurality of cells as passages for fluid;

drying the honeycomb formed body;

calcinating the honeycomb formed body to obtain a calcinated body; and
firing the calcinated body to obtain the porous honeycomb structure;
wherein the clay contains .01 to 10 parts by mass of the alkali metal source in terms of alkali metal with respect to 100 parts by mass of the aggregate raw material; and
wherein the alkali metal source is selected from the group consisting of potassium hydroxide and sodium hydroxide.

Without conceding the propriety of the rejection, independent claim 11 is amended to more clearly recite various novel features of the claimed invention, with particular attention to the Examiner's comments. Specifically, independent claim 11 is amended to recite:

Claim 11:

A honeycomb formed body comprising clay containing at least an aggregate raw material, water, an organic binder, a pore-forming agent, and an alkali metal source, the aggregate raw material comprising metal silicon and a non-oxide ceramic containing silicon, the honeycomb formed body having a plurality of cells as passages for fluid;

wherein the clay that forms the honeycomb formed body contains .01 to 10 parts by mass of the alkali metal source in terms of alkali metal with respect to 100 parts by mass of the aggregate raw material; and

wherein the alkali metal source is selected from the group consisting of potassium hydroxide and sodium hydroxide.

The applied references fail to teach or render obvious, or establish any reason or rationale to provide, such a combination of features, as recited in claim 7 and amended claim 11.

The Office Action acknowledges that (1) Tomita discloses alkaline earth metal hydroxides as opposed to alkali metal hydroxides and (2) Tomita fails to disclose the presence of a pore forming agent. See Office Action, pages 3 and 4. The Office Action asserts it would have been obvious to one of ordinary skill in the art at the time of the invention (1) that any hydroxide would equally serve the purpose of the metal element and (2) to add a pore forming agent as taught by Stobbe to the slurry for a ceramic honeycomb made of SiC particles as taught by Tomita to form a more porous honeycomb structure, which

yields more efficient exhaust gas filtration. See Office Action, page 4. Applicants respectfully disagree.

One of ordinary skill in the art would have had no reason or rationale to combine Tomita with Stobbe to provide the features of claims 7 and 11, because the proposed modification improperly renders the primary reference unsatisfactory for its intended purpose (see MPEP §2143.01(V)) and there would be no reasonable expectation of successfully obtaining a silicon carbide-based porous material having high strength and high thermal conductivity.

Tomita is directed to a silicon carbide-based porous material wherein the wettability between silicon carbide particles and metallic silicon is improved, and a silicon carbide-based porous material having improved strength and thermal conductivity. See Tomita, Abstract and paragraph [0064]. However, Tomita discloses that when the eutectic point between the metal element and silicon dioxide is below 1,200°C wettability improvements and contact area enlargement are hardly obtained. See Tomita, paragraph [0066], reproduced below (in-part) for convenience (emphasis added).

...When the eutectic point is below 1,200°C, the melt of MO- (M₁O-, M₂O-, . . .)SiO₂ system does not remain at about the firing temperature at which metallic silicon melts, and the above-mentioned wettability improvement and contact area enlargement are hardly obtained during firing; therefore, such an eutectic point is not preferred. Meanwhile, when the eutectic point is more than 1,600°C, the reaction between MO (M₁O, M₂O, . . .) and SiO₂ does not proceed sufficiently during firing and the above-mentioned wettability improvement and contact area enlargement are hardly obtained; therefore, such an eutectic point is not preferred.

Submitted herewith are phase diagram charts of Na₂O-SiO₂ and K₂O-SiO₂ systems, establishing that the eutectic points for sodium or potassium and silicon dioxide are not higher than 1000 °C. As mentioned above, Tomita discloses that when the eutectic point is below 1,200°C, such as for sodium and potassium as seen in the attached phase diagram

charts, wettability improvements and contact area enlargement are hardly obtained.

Therefore, the Office Action's proposed modification improperly renders the primary reference unsatisfactory for its intended purpose. See MPEP §2143.01(V).

Furthermore, one of ordinary skill in the art would have had no reason or rationale to combine the pore forming agent of Stobbe and the components disclosed in Tomita with any reasonable expectation of success of obtaining a silicon carbide-based porous material having high strength and high thermal conductivity because the addition of a pore forming agent would disrupt the bonding of the silicon carbide particles and metallic silicon of Tomita.

Tomita teaches that as a result of the contact of at least four silicon carbide particles with metallic silicon the bonded portions of the porous structure are thick and the material has high strength and high thermal conductivity. See Tomita, paragraph [0040] reproduced below for convenience (emphasis added).

The silicon carbide-based porous material of the present invention is characterized in that a large number of secondary texture particles (each secondary texture particle is hereinafter referred to as "domain") each of which is formed by contact of at least four silicon carbide particles with one metallic silicon are bonded to each other to form a porous structure. That is, domains are bonded to each other to form a porous structure; as a result, the bonded portions are thick and the silicon carbide-based porous material has properties such as high strength, high thermal conductivity and the like.

One of ordinary skill in the art would recognize that the presence of a pore forming agent would sterically disrupt and not allow for the contact of at least four silicon carbide particles with metallic silicon and, thus, not result in the high strength silicon carbide-based porous material of Tomita. Therefore, the proposed modification would improperly render the prior art unsatisfactory for its intended purpose. See MPEP §2143.01(V). Accordingly, the rejection is improper, at least because the Office Action has failed to establish a proper *prima facie* case of obviousness.

Therefore, for at least the reasons set forth above, independent claims 7 and 11 would not have been rendered obvious because Tomita and Stobbe, considered either separately or combined, fail to teach or suggest, or establish any reason or rationale to provide every feature of independent claims 7 and 11. Claims 9 and 13 depend from claim 7 and 11, respectively, and, thus, also would not have been rendered obvious over Tomita and Stobbe. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

B. Joulin

The Office Action rejects claims 7, 9, 11 and 13 under 35 U.S.C. §103(a) over U.S. Patent No. 6,582,796 to Joulin et al. (hereinafter "Joulin"). Applicants respectfully traverse the rejection.

First, as discussed above, by this Amendment, claim 11 is amended to more clearly distinguish over the applied references. Specifically, claim 11 is amended to recite "the aggregate raw material comprising metal silicon and a non-oxide ceramic containing silicon." Joulin fails to teach or render obvious, or establish any reason or rationale to provide, such a combination of features, as recited in claim 11. For example, Joulin does not disclose the use of metal silicon and, thus, the honeycomb structure of Joulin does not contain metal silicon and Joulin provides no reason or rationale to modify the honeycomb structure to introduce metal silicon.

Next, independent claim 7 is a method claim that requires the adding of KOH or NaOH as a raw material, rather than the "*in-situ*" formation of KOH or NaOH as may occur in Joulin after the addition of a simple oxide. Joulin does not disclose "adding" of KOH or NaOH as a raw material, as required by claim 7, and the Office Action acknowledges that formation of KOH and NaOH would only occur *in-situ*. See Office Action, page 6. Accordingly, Joulin fails to teach or suggest, or establish any reason or rationale for one of ordinary skill in the art to carry out the process of claim 7.

Furthermore, the Office Actions reliance on *In re Gibson* is misplaced. MPEP 2144 (III) states that if the facts in a prior legal decision are sufficiently similar to those in an application under examination, the examiner may use the rationale used by the court. In *In re Gibson*, it was conceded that the ingredients and the proportions of those ingredients were the same. See *In re Gibson*, 39 F.2d 975 (CCPA 1930). In the present rejection, the ingredients and the proportions of those ingredients are not the same. The Office Action even admits that the raw material of Joulin is not KOH or NaOH. See Office Action, page 6. Therefore, the facts of *In re Gibson* are not sufficiently similar to those in the instant case for the Office Action to use the rationale set forth in *In re Gibson*.

Additionally, Joulin teaches the use of significantly more alkaline metal, which is unfavorable in independent claims 7 and 11. It appears that the Office Action may be taking Official Notice that an alkali metal source of KOH or NaOH, as recited in claims 7 and 11, will behave identically as the simple oxides of Joulin if replaced. To the extent the assertions in the Office Action are based on official notice, such bases are not properly established and are thus improper.

With respect to Official Notice, the MPEP states that “such rejections should be judiciously applied” (see MPEP § 2144.03). “Official notice without documentary evidence to support an [E]xaminer’s conclusion is permissible only in some circumstances” (see MPEP § 2144.03(A)). “It would not be appropriate for the [E]xaminer to take official notice of facts without citing a prior art reference where the facts asserted to be well known are not capable of instant and unquestionable demonstration as being well-known” (see *Id.*, emphasis added).

Here, the application of Official Notice is not established and, thus, is improper at least because Joulin discloses that 18-15% of a simple oxide achieves ideal results, whereas the present specification discloses that when alkaline metal exceeds the range recited in claims 7 and 11, as in comparative example 3 (14% KOH), the alkali silicate glass formed by

the alkaline metal fills in pores of the calcinated body, and porosity unfavorably decreases. See specification, page 11, line 23 - page 12, line 2. Thus, it appears simple oxides will not behave identically as KOH or NaOH.

Thus, for at least the reasons set forth above, claims 7 and 11 would not have been rendered obvious by Joulin. Claims 9 and 13 depend from claims 7 and 11, respectively, and thus, also would not have been rendered obvious by Joulin. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

III. Double Patenting

The Office Action provisionally rejects claims 7, 9-11, 13 and 14 on the ground of non-statutory double patenting over claims 9-16 of Copending Application No. 10/531,578. By the Amendment filed September 3, 2008, claims 10 and 14 were canceled, rendering their rejection moot. As to the remaining claims, Applicants respectfully traverse the rejection.

Without admitting to the propriety of the rejection, and in the interest of advancing prosecution, Applicants are simultaneously filing herewith a Terminal Disclaimer over the cited reference, thus obviating the rejection. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

IV. Conclusion

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,



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Attachments:

Phase Diagrams

Terminal Disclaimer

Date: March 6, 2009

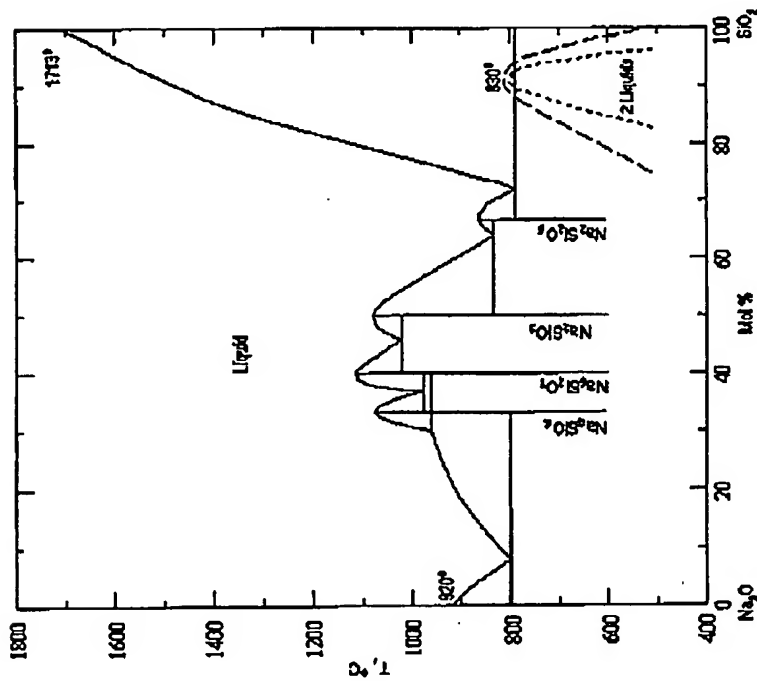
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Na2O-SiO2

Fig. 09202.—System Na₂O-SiO₂. Calculated diagram and subliquidus miscibility gap. The dashed and dotted curves represent the subliquidus and spinodal curves. The melting points of Na₂O (920°C) and SiO₂ (1713°C) were from Refs. 1 and 2, respectively.

S. S. Kim and T. H. Sanders, Jr., *J. Am. Ceram. Soc.*, 74 [8] 1833-1840 (1991).

Kracak's diagram (Fig. 192) above 50% SiO₂ and Loeffler's diagram (Fig. 5122) below 50% SiO₂ were chosen to describe the behavior of the liquid solutions in this system. A subregular solution model was applied to obtain the Gibbs free energy expression for the liquid phase. The interaction parameters of the liquid phase were obtained by using the liquidus curves of silica (and subliquidus data) through the multiple linear regression method.

The asymmetric subliquidus miscibility gap established in Ref. 3 was used in this calculation. The calculated liquidus is satisfactory except for a slight deviation from the experimental liquidus near the eutectic point of the high-silica side. The calculated critical point (830°C at 92 mol% SiO₂) agrees with the experimental data (837°C at 92 mol% SiO₂).

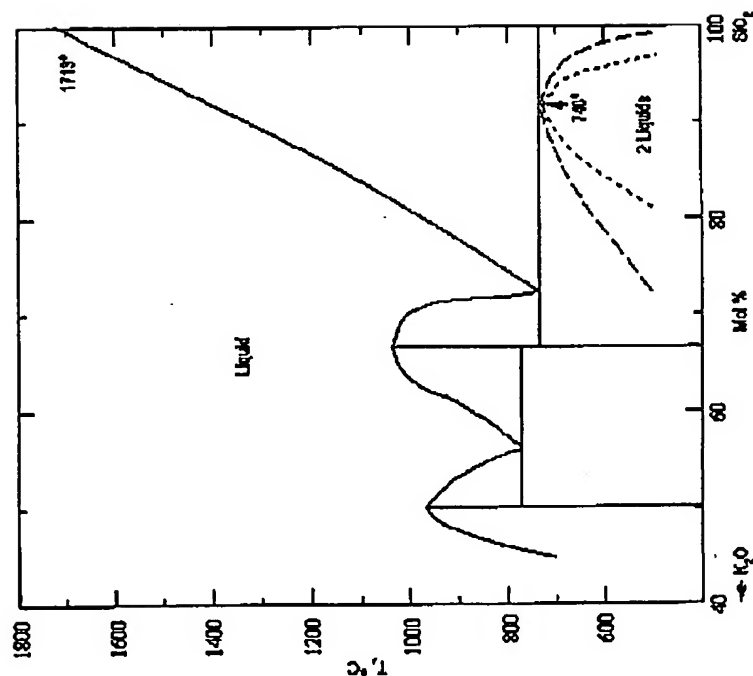
1. G. V. Samsonov, *The Oxide Handbook*, 2nd ed; 453 pp. IFI/Plenum Publishing, New York, New York, 1982.

2. F. C. Kracke, *J. Am. Ceram. Soc.*, 52 [4] 1438-1442 (1930).

3. W. Haller, D. H. Blackburn, and J. H. Simmons, *J. Am. Ceram. Soc.*, 57 [3] 120-126 (1974).

S.H.

G.L.G.



K2O-SiO2

Fig. 09185—System K2O-SiO2. Calculated diagram and subliquidus miscibility gap using experimental critical points from Refs. 1 (Fig. (A)) and 2 (Fig. (B)). The dashed and dotted curves represent the estimated subliquidus and spinodal curves. The melting points of K2O (707°C) and SiO2 (1713°C) were from Refs. 3 and 4, respectively. KS = K2SiO3; KS2 = K2Si2O5; KS4 = K2Si4O9.

S. S. Kim and T. H. Sanders, Jr., *J. Am. Ceram. Soc.*, 74 [8] 1833-1840 (1991).

Kracsek's diagram (Fig. 167) was used to describe the behavior of the liquid solutions in this system. A subregular solution model was applied to obtain the Gibbs free energy expression for the liquid phases. The interaction parameters of the liquid phase were obtained by using the liquidus curves of silica (and subliquidus data) through the multiple linear regression method. Figure (A) was calculated by using the Moriya et al. critical point (750°C) along with the liquidus data. The calculated critical point is reasonably located at 740°C and 82 mol% SiO2. However, while the experimental eutectic point between K2Si4O9 and SiO2 is located at 767°C and 81 mol% SiO2, the calculated liquidus at this temperature is 72 mol% SiO2, which is not only below the eutectic composition, but also smaller than the composition of K2Si4O9. So, this calculated result does not allow an intermediate congruent phase K2Si4O9. This result appears to be unreasonable.

Figure (B) was calculated by using the Kawamoto and Tomozawa critical point (555°C and 94.5 mol% SiO2) along with the liquidus data. The calculated critical point is located at 550°C and 84.5 mol% SiO2. The calculated results show good agreement with experimental data for liquidus and subliquidus curves.

1. Y. Moriya, D. H. Warrington, and R. W. Douglas, *Phys. Chem. Glasses*, 8 [1] 19-25 (1967).

2. Y. Kawamoto and M. Tomozawa, *J. Am. Ceram. Soc.*, 64 [5] 289-292 (1981).

3. G. V. Samsonov, *The Oxide Handbook*, 2nd ed., 483 pp. IFI/Plenum Publishing, New York, New York, 1982.

4. F. C. Kracsek, *J. Am. Chem. Soc.*, 52 [4] 1436-1442 (1930).

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